

Remarks

The foregoing amendment cancels claims 17-39, amends the first paragraph of the specification and claims 1, 40, 42 and 43, and adds claims 44-53. Pending in the application are claims 1-16 and 40-53, of which claims 1, 40, 42, 43, 50 and 53 are independent. The following comments address all stated grounds for rejection and place the presently pending claims, as identified above, in condition for allowance.

Claims 1, 40, 42 and 43 are amended to specify that the droplet ejection nozzle is located in the tip of the dispensing pin.

New claims 44-47 depend from claim 1 and recite subject matter found in original claims 17-18 and 25-26.

New claim 48 depends from claim 1 and further recites that the sample filling channel, the sample chamber and the droplet ejection nozzle form a substantially U-shaped fluid path through the tip, as shown in Figure 3.

New claim 49 depends from claim 1 and specifies that the droplet ejection nozzle is tapered.

New independent claim 50 recites a dispensing pin having a tip, a substantially U-shaped fluid path through the tip and an actuator coupled to a portion of the fluid path for forming a droplet of the liquid sample upon activation of the actuator.

New independent claim 53 is directed to a sample dispensing system including a holder and a dispensing pin. A first end of the dispensing pin is coupled to holder, and a sample filling channel, sample chamber, droplet ejection nozzle are all formed in a tip at the second end of the dispensing pin.

Amendment of the claims are not to be construed as an acquiescence to any of the objections/rejections set forth in the instant Office Action, and were done solely to expedite

prosecution of the application. Applicant reserves the right to pursue the claims as originally filed, or similar claims, in this or one or more subsequent patent applications.

Restriction Requirement

Regarding the Restriction Requirement issued for the present application, Applicant confirms the election of group I, with traverse. To expedite allowance of the application, Applicant has canceled claims 17-39 in view of the Restriction Requirement.

Amendments to the Specification

Regarding the objection to the specification, Applicant has amended the first paragraph of the specification to specify the Serial Numbers for the Patent Applications that are incorporated by reference. At the time of filing of the present application, the Serial Numbers for the Patent Applications were not known, since the applications incorporated by reference were filed on the same day as the present application. Because the specification is now in proper format, Applicant respectfully requests that the objection be reconsidered and withdrawn.

Objections to the Drawings

Regarding the objection to the drawings for being informal, Applicant includes herewith formal drawings (Figures 1-5), which comply with the requirements of 37 C.F.R. § 1.85(a). Accordingly, Applicant respectfully requests that the objection to the drawings be reconsidered and withdrawn.

Art Rejections

The Examiner rejects claims 1, 4, 7-10, 12, 17, 21, 24-26, 28, 33-36 and 39-43 under 35 U.S.C. 102(b) as being anticipated by Blanchard et al. (U.S. Patent Number 6,028,189). The Examiner also rejects claims 2-3, 5-6, 11, 13-16, 18-20, 22-23, 27, 29-32 and 37-38 under 35 U.S.C. 103(a) as being obvious over the Blanchard reference. Applicant

respectfully traverses the rejection and submits that the presently pending claims, as identified above, are patentable over the Blanchard reference.

Independent claim 1 is directed to a sample dispensing system comprising a dispensing pin having a tip and a sample chamber formed in the tip. The sample chamber holds a predetermined volume of sample. A sample filling channel is also formed in the tip and in fluid communication with the sample chamber for loading a liquid sample into the sample chamber. A droplet ejection nozzle also located in the tip and in fluid communication with the sample chamber for ejecting a droplet of the liquid sample from the sample chamber. An actuator is coupled to the sample chamber for forming the droplet upon activation of the actuator. As clearly recited, the tip includes both a filling structure for loading the dispensing system with a liquid sample and a separate droplet actuation structure for forming and ejecting droplets of the liquid sample from the tip of the dispensing pin.

The Blanchard reference is directed to a method for handling reagents. Blanchard describes an array of pumps for delivering specified volumes of synthesis reagents to wells. Each pump includes an inlet end having an inlet channel and an exit channel formed on an opposite end of the pump from the inlet end, as clearly shown in Figure 2. A reagent reservoir is formed between the inlet end and the outlet end.

The Blanchard reference does not teach or suggest a dispensing pin that includes both a filling structure and a separate droplet actuation structure co-fabricated on a tip of the dispensing pin to form a fluid path through the dispensing pin tip for loading a supply of a liquid sample and dispensing the liquid sample in the form of liquid droplets. The pump described in Blanchard does not teach or suggest a sample filling channel, a sample chamber and an ejection nozzle co-located on one end (i.e., the tip) of a dispensing pin, as recited in claim 1. Rather, the pump in Blanchard is required to be filled from behind the reagent reservoir, at a first end, and the reagent must travel to the *opposite* end of the pump to be ejected, which leads to a longer fill time.

In fact, Blanchard teaches away from co-locating a filling channel, a sample chamber and an ejection nozzle on one end of a dispensing pin. For example, Blanchard specifically

requires the filling channel and the ejection nozzle to be located on opposite ends of the pump, in order to pump liquid from a supply of reagent solution on a first side of the pump to an array on a second, opposite side of the pump, as clearly shown in Figures 3 and 4. In contrast, the configuration of the claimed sample dispensing system, as recited in claim 1 allows the dispensing pin to be inserted into a supply of sample to fill the sample chamber via the inlet channel in the tip. After loading, a droplet of the sample can be ejected from the tip, via the ejection nozzle, without flipping or turning the dispensing pin, which would be required when using the pump of Blanchard.

Because the Blanchard reference does not teach or suggest a dispensing pin having a filling channel, a sample chamber and an ejection port co-located on the tip of the dispensing pin, independent claim 1, and claims 2-16, which depend from claim 1, are patentable over the Blanchard reference.

The Blanchard reference also does not teach or suggest a filling nozzle for introducing a liquid sample to the filling channel, as recited in claim 9.

The Blanchard reference also does not teach or suggest a filling nozzle on a dispensing pin tip that extends beyond an ejection nozzle or ejection port in the tip, as recited in claim 10. Rather, as described above, the Blanchard pump includes a filling port and an ejection port on opposite ends of the pump. A significant advantage of the configuration set forth in claim 10 is that the tip of the pin can be dipped into a reservoir containing a liquid sample to load the liquid sample onto the pin, without also immersing the ejection nozzle, which is also formed in the tip.

Independent claims 40, 42 and 43, and dependent claim 41 are also patentable over the Blanchard reference for the same reasons that claim 1 is patentable over the Blanchard reference. As described above, the Blanchard reference does not teach or suggest a dispensing pin including a droplet ejection nozzle located on the same end of a pin, i.e., in the tip, as a sample filling channel.

New claims

Newly added claims 44-47 depend from claim 1 and recite additional patentable features that are neither taught nor suggested in the Blanchard reference. For example, claim 44 further recites a second pin spaced from the dispensing pin to form a second filling channel between the dispensing pin and the second pin, a feature neither taught nor suggested in the Blanchard reference. The Blanchard pump is not formed of two pins, since neither the glass membrane nor the silicon substrate form a pin structure having a tip. Claim 45 recites that the dispensing pin and the second pin are movable relative to each other to vary the size of the filling channel, a feature neither taught nor suggested in the Blanchard reference. The size of the inlet channel in the Blanchard pump is fixed, since the inlet channel is formed in the silicon substrate. Furthermore, the membrane and the silicon substrate are clearly *not* movable relative to each other, since the glass membrane is “bonded” to the silicon.

Claim 49 also defines over the Blanchard reference, because the ejection head of the Blanchard pump is not a tapered nozzle. Rather, as clearly shown in Figure 2, the ejection head in the Blanchard pump has a constant cross section that does not form a nozzle. In the present invention, the ejection channel includes a taper, which facilitates ejection of the droplet from the dispensing pin. The taper forming the ejection nozzle is specifically designed to accelerate and direct the flow of liquid from the sample chamber, such that droplets are propelled ballistically from the tip of the dispensing pin. The Blanchard reference does not teach or suggest such a feature or object.

Independent claim 50, and dependent claims 51-52, which depend from claim 50 and claim 48, which depends from claim 1, also recite patentable subject matter, because the Blanchard reference clearly does not teach or suggest a substantially U-shaped fluid path through the tip of a dispensing pin for conveying a liquid sample. Rather, the fluid path in the pump of Blanchard is straight and linear through the pump. Because the Blanchard reference requires the substrate on which the reagent is applied and the supply of reagent solution to be located on opposite ends of the pump, it would not be feasible for the pump of Blanchard to have a U-shaped or even curved fluid path.

New independent claim 53 is also patentable over the Blanchard reference, because Blanchard clearly does not teach or suggest a dispensing pin having a first end coupled to a holder and a second end forming a tip that includes a sample filling channel, a sample chamber, and a droplet ejection nozzle. It would be impossible for the pump of Blanchard to have one end coupled to a holder, because Blanchard requires one end to form a sample inlet and the *other* end to form a sample outlet. Therefore, none of the ends in the pump of Blanchard could be coupled to a holder.

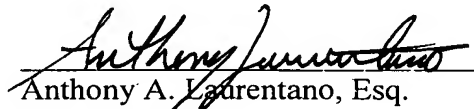
CONCLUSION

For these reasons, Applicant contends that claims 1-16 and 40-53 are patentable and that the claims are clear and definite. As such, the Examiner's objections and rejections so far as they are based upon 35 U.S.C. §102 and 35 U.S.C. §103 should be reconsidered and withdrawn. Allowance of the pending claims at an early date is solicited.

If, however, the Examiner considers that obstacles to allowance of these claims persist, we invite a telephone call to Applicant's representative.

Respectfully submitted,

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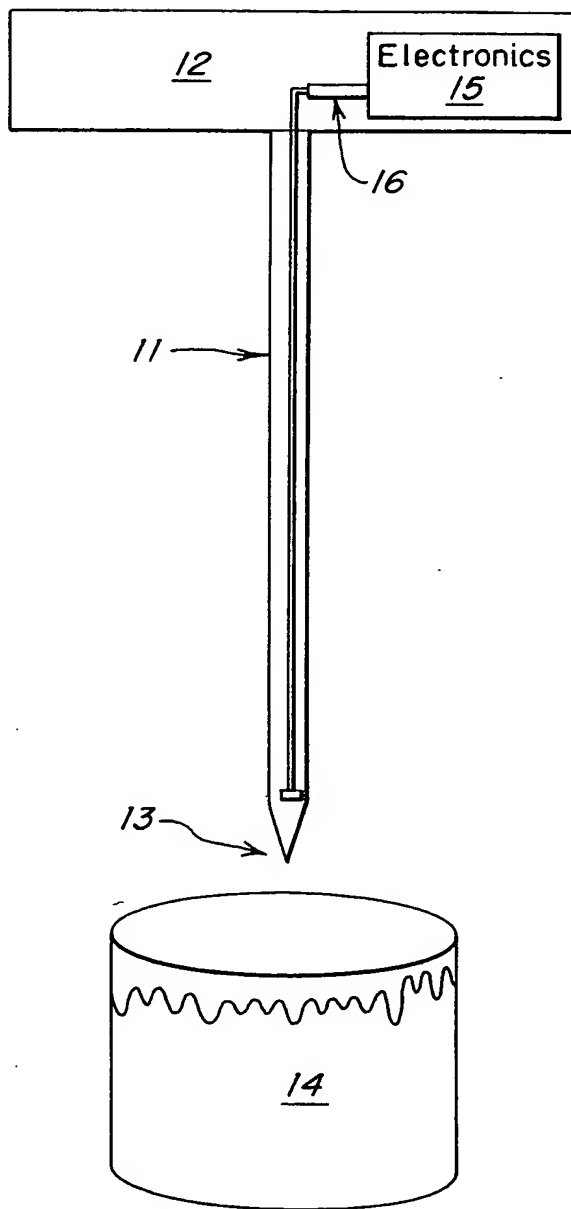
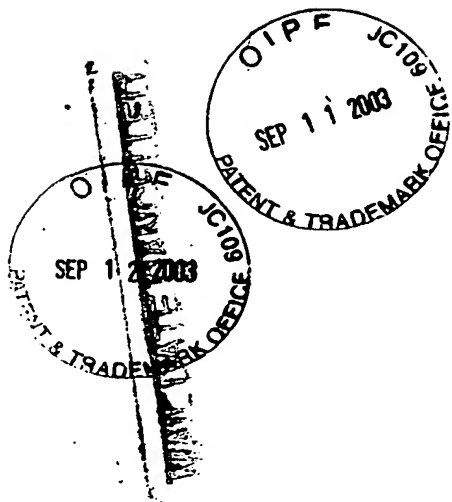


FIG. 1



U.S. Patent Application No.: 10/029108
Applicant: John R. Gilbert
Docket No.: TGZ-005
Title: DROPLET DISPENSING SYSTEM
Express Mail Label No.: EV355387684US

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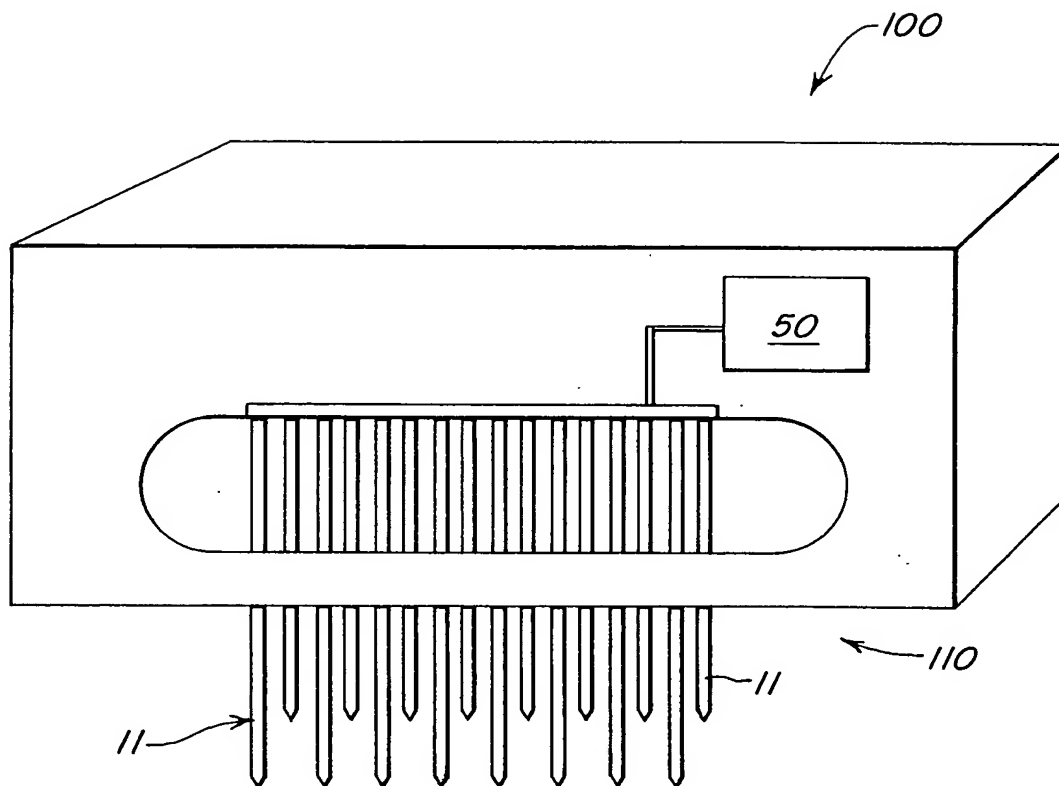


FIG. 2

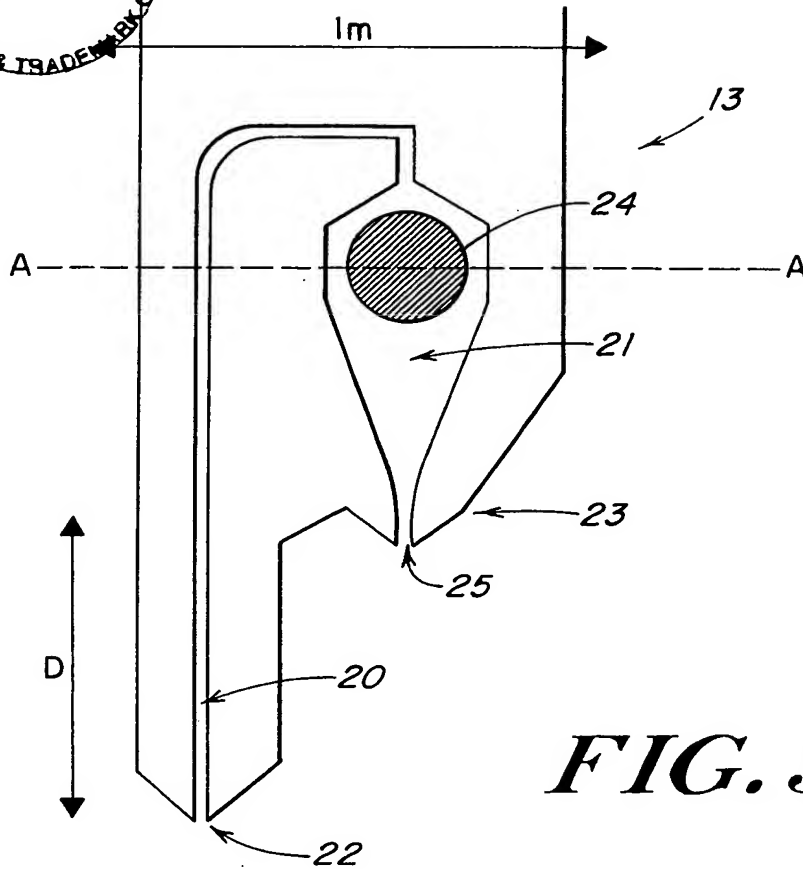
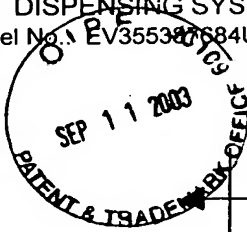


FIG. 3

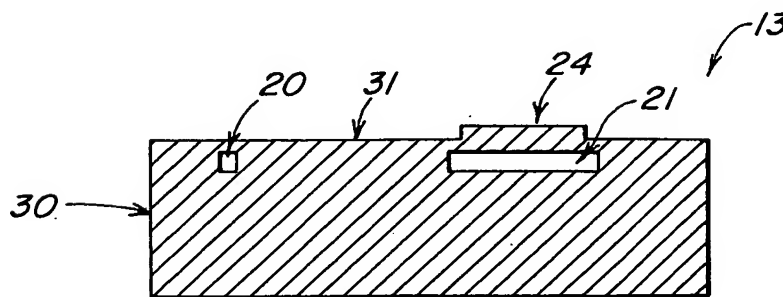


FIG. 4

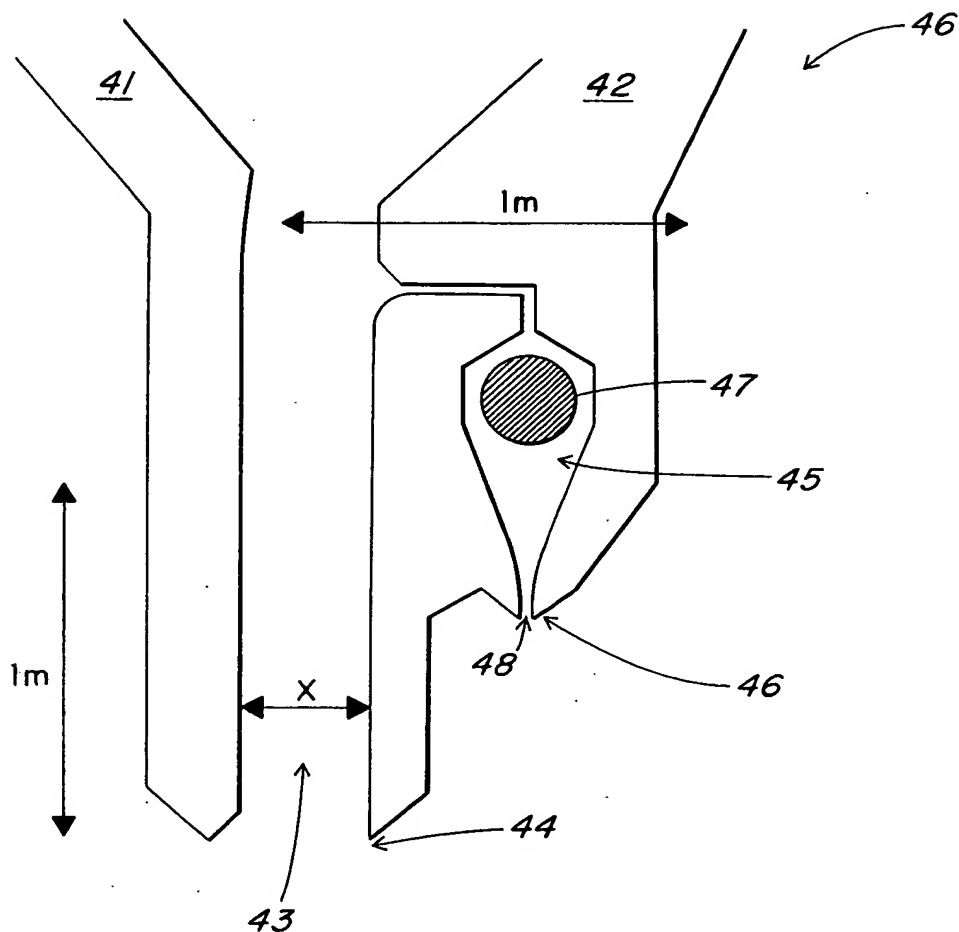


FIG. 5